

LAWRENCE LIVERMORE REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, March 14-18, 2011

NARAC looks to the sky over Japan



The NARAC Operations Center.

Scientists at the Lab's National Atmospheric Release Advisory Center have been working around the clock since last Friday monitoring the air space over Japan.

Upon hearing word that the Fukushima Daichi Nuclear Power Station was in danger of melting because the cooling systems were knocked out by the earthquake and ensuing tsunami last week, the National Nuclear Security Administration called to activate NARAC.

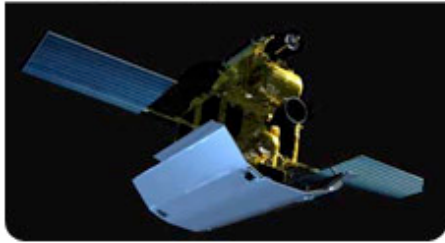
Since then, meteorologists, nuclear scientists and computer scientists have provided ongoing predictive atmospheric modeling to the government on the latest information available, including dose and surface contamination estimates.

The ominous chapter in Japan's history continues in the seven-day long effort by Japanese engineers to bring four side-by-side reactors under control after their cooling systems were knocked out.

CNN recently aired a report on the capabilities of NARAC. To see the video, go to the [Web](#).

To Mercury and beyond

Tri-Valley Herald



MESSENGER readies for Mercury orbit insertion.

When a NASA spacecraft went into orbit around Mercury Thursday evening, a team of Laboratory researchers paid very close attention.

During 2002 and 2003, the LLNL scientists developed a germanium-based gamma ray spectrometer that has been winging its way aboard the Mercury MESSENGER (short for MErcury Surface, Space Environment, GEochemistry and Ranging) for the past six-and-half years.

MESSENGER started a highly elliptical orbit of Mercury at 6 p.m. (Pacific Daylight Time) Thursday, coming as close as 200 kilometers (120 miles) to the planet and as far as 15,000 kilometers (9,000 miles) away. It will be the first spacecraft to orbit Mercury, circling the planet every 12 hours for one year.

Livermore's gamma ray spectrometer will help determine the elemental and mineral composition of Mercury's surface.

To read more, go to the [Web](#).

Coming to an electrical storage system near you



Carbon aerogels may be used in future energy applications.

Because of their unique structure, carbon aerogels may be used for hydrogen and electrical energy storage in the future.

Carbon aerogels (CAs) are a unique class of high-surface area materials derived by sol-gel chemistry in which the liquid component of a polymer gel has been replaced with a gas.

Their high surface area and electrical conductivity, environmental compatibility and chemical inertness make them very promising materials for many energy-related applications.

Recent Laboratory research has shown that the structure of CAs can be manipulated for a variety of uses in the energy field, from hydrogen and electrical storage to desalination and catalysis.

To read more, go to the [Web](#).

The quest for fusion



The NIF target chamber.

Physicists at the National Ignition Facility (NIF) have taken an important step in the bid to generate fusion energy (the same energy that powers the sun and the stars) using ultra-powerful lasers. By focusing NIF's 192 laser beams onto a tiny gold container, researchers have achieved the temperature and compression conditions that are needed for a self-sustaining fusion reaction -- a milestone that they hope to pass next year.

NIF will provide data for nuclear weapons testing as well as carry out fundamental research in astrophysics and plasma physics. The facility also will aim to fuse the hydrogen isotopes deuterium and tritium to demonstrate the feasibility of laser-based fusion for energy production.

One of the main aims of NIF is to achieve "ignition," which means that the fusion reactions generate enough heat to become self-sustaining. Researchers hope that by burning some 20

percent to 30 percent of the fuel inside each sphere, the reactions will yield between 10 and 20 times as much energy as supplied by the lasers.

To read more, go to the [Web](#).

Ready, set, go



The best and brightest student scientists and engineers will showcase their work when the annual Tri-Valley Science and Engineering Fair, sponsored by the Laboratory, returns next week (March 22-25) to the Robert Livermore Community Center, 4444 East Ave., Livermore. This year the fair reaches a milestone celebrating 15 years in the community.

The fair motivates students to apply creativity and critical thought to solve science, engineering and math problems; encourages the exchange of knowledge and ideas; and recognizes student achievement.

This year's participants include 413 students from grades 7-12 attending public, private or parochial schools in Danville, Dublin, Livermore, Pleasanton, San Ramon and Sunol. A total of 300 projects will be presented; students may work in teams.

Science projects are judged on a range of criteria that represent standards of research held by the scientific community. Local scientists and engineers serve as judges, with more than 80 participating from the Lab.

The public may view the exhibition of student projects at the Robert Livermore Community Center on Thursday, March 24, from 10 a.m. to 5 p.m. Admission is free.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research

institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

To send input to the Livermore Lab Report, send e-mail <mailto:labreport@llnl.gov>.

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